

C0-R4.B3: DATA STRUCTURE THROUGH JAVA

NOTE:

1. Answer question 1 and any FOUR from questions 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours

Total Marks: 100

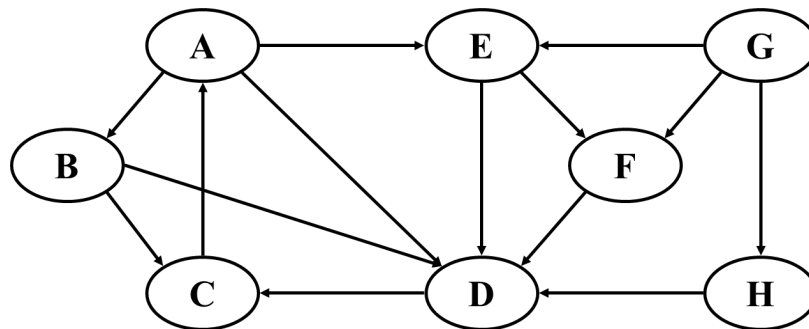
1.
 - a) How do you find the complexity of an algorithm? What is the relation between the time and space complexities of an algorithm? Justify your answer with an example.
 - b) Which comparison based sorting algorithm is best if the list is already sorted? Justify your answer with an example.
 - c) Write an algorithm for finding solution to the Towers of Hanoi problem. Explain the working of algorithm with 4 disks.
 - d) An abstract class is a class designed with implementation gaps for subclasses to fill in. Justify the statement.
 - e) What do you mean by complexity of an algorithm? Explain the meaning of worst case analysis and best case analysis with an example.
 - f) How many key comparisons and assignments an insertion sort makes in its worst case for an array of size n ?
 - g) What is recursion? Write a recursive program to reverse a string.

(7x4)

2.
 - a) Java gives rich supports for variables. Which are the different types of variable available in java? Explain the scope and lifetime of those variables.
 - b) By literal we mean any number, text, or other information that represents a value. Write a short note on java literals.

(9+9)

3.
 - a) Show how Depth-First Search (DFS) works on the graph of following figure. Assume that the DFS procedure considers the vertices in alphabetical order, and assume that each adjacency list is ordered alphabetically. Show the discovery and finishing times for each vertex.



- b) What happens when an object is created in Java? Why java doesn't provide destructor?
- c) What are the advantages of method overloading? How java supports the method overloading? Explain with example.

(6+6+6)

- 4.
- Compare two functions n^2 and $2^n/4$ for various values of n . Determine when second becomes larger than first.
 - In Java classes, constructors, methods and fields are regulated using access modifiers. What is access modifier? Explain various access modifiers available in java.
 - What is a Binary Search Tree (BST)? Make a BST for the following sequence of numbers. Traverse the tree in Preorder, Inorder and postorder.
45, 36, 76, 23, 89, 115, 98, 39, 41, 56, 69, 48

(4+6+8)

- 5.
- List the advantages of doubly linked list over singly linked list. Write the step to delete a node x from a given singly linked list. Delete operation contains two parameter i.e. Delete (x , head), where head contains the address of first node of the linked list.
 - Show the content of circular queue with front and rear pointer after each operation. Initially queue is empty. Size of queue is 5. The sequence of operation given below:
 - Insert 10, 50, 40, 80
 - Delete
 - Insert 200, 70, 150
 - Delete
 - Sort the following sequence of keys using merge sort.
66, 77, 11, 88, 99, 22, 33, 44, 55

(9+4+5)

- 6.
- Implement a Queue using a singly linked list such that the operations INSERT and DELETE should take $O(1)$ time.
 - Write a java code to insert a node in the beginning of the linked list.

(10+8)

- 7.
- Explain different asymptotic notations with suitable example.
 - What is String matching? Explain Brute-Force String matching algorithm with suitable example.
 - What is runtime polymorphism? List the conditions that need to be met if someone wants to use runtime polymorphism.

(6+6+6)